MATH 221/222
Honors Calculus III and IV
2016/2017

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Office hours are variable—make an appointment
Class meetings: MWF 11:00-11:50 in HB 227

The text for this course may be read online: http://www.owlnet.rice.edu/~fjones
Formerly we sold hard copies of this text. However, gradually students began to prefer reading the text on their own computers, so we no longer sell hard copies.

Rice's *General Announcements* also has a great deal to say about MATH 221/222. Here are some items of great importance:

1. The usual multivariable calculus course at Rice, MATH 212, is a one-semester course. The honors course takes this material and greatly expands it to twice the amount of time. This allows us to go into interesting points that must be skipped in 212, to do a great deal of the development in n-dimensional space, and to provide many interesting proofs and examples along the way.

2. This course contains a mixture of theory and computations. Understanding the theory should greatly assist the computations, and doing the computations helps the comprehension of the theory.

3. We do *no* "hard proofs." We feel these are better left to MATH 321 or 331, *Introduction to Analysis I*, and MATH 322, *Introduction to Analysis II*. But we shall constantly be doing the easy proofs, and you will need to learn how to write out proofs in good English.

4. MATH 211, *Ordinary Differential Equations and Linear Algebra*, contains mostly material that is not touched on in our course. (However, we do cover a great deal of linear algebra.) Therefore, if your degree plan for a major other than MATH requires MATH 211, you likely will need to fulfill that requirement by taking 211. It is very important for you to discuss this with a faculty adviser in what may become your major department.

5. MATH 382, *Complex Analysis*, is an exciting course and the gateway into much beautiful and profound and useful and very accessible mathematics. The basic item of background needed for this course is Green's theorem, which is the title of Chapter 12 of our text. Since MATH 382 is a spring course, and I want you to be prepared to take it this coming spring, we will cover Green's theorem this fall. We'll have to take some things on faith until 222, but I think the exercise will be beneficial to all of you, even if you do not choose to enroll in 382 this coming spring.

6. Administration of MATH 221:

- Homework will be assigned almost every day, will usually be quite short, and will be due at the beginning of the next class period . . . no late homework will be accepted. From time to time there will be longer assignments, and you will have longer time to work on them. Homework represents a major portion of the course. I strongly encourage you to work together on homework. It is not usually a good idea to spend lots of time while stuck on a problem: seek help! I am available!

Help sessions are provided every Sunday, Tuesday, and Thursday night in HBH 227, with help from upper class students.

- Examinations will be take-home, and there will be several of these during the semesters. These will come at logical points in the development of the material.
- Final examination will also be take-home, and will be due the last day of the final examination period, December 16.
- Course grade is based on your performance during the entire semester. The general guideline is approximately

Homework 40% Exams 40% Final exam 20%

I will take all aspects of your performance into account, especially how well you **finish**. For instance, a low grade near the start of the semester can be completely offset by subsequent strong work. My goal is for you to *finish* the semester with a through understanding of the material we have covered.

7. CHAPTER TITLES:

1. Euclidean space
2. Differentiation
3. Higher order derivatives
4. Symmetric matrices and the second derivative test
5. Manifolds
6. Implicit function theorem
7. Cross product
8. Volumes of parallelograms
9. Integration on R^n
10. Further investigation of integration
11. Integration on manifolds
12. Green's theorem
13. Stokes' theorem
14. Gauss' theorem
15. ∇ in other coordinates